PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 214458WO	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US03/19884	International filing date *(day/month/year)* 30 July 2003 (30.07.2003)	Priority date *(day/month/year)* 31 July 2002 (31.07.2002)
International Patent Classification (IPC) or national classification and IPC IPC(7): C23C 16/509, 16/50; C23F 1/00; H01L 21/306 and US Cl.: 118/723E, 723I, 723R, 719; 156/345.31, 345.32, 345.43, 345.48		
Applicant TOKYO ELECTRON LIMITED		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of ___ sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
05 January 2004 (05.01.2004)	28 December 2004 (28.12.2004)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Rudy Zervigon Telephone No. 703.308.0661

Form PCT/IPEA/409 (cover sheet)(July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US03/19884

I. Basis of the report

1. With regard to the elements of the international application:*

☒ the international application as originally filed.

☒ the description:
pages 1-11 as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____.

☒ the claims:
pages 12-16 , as originally filed
pages NONE , as amended (together with any statement) under Article 19
pages NONE , filed with the demand
pages NONE , filed with the letter of _____.

☒ the drawings:
pages 1-8 , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____.

☐ the sequence listing part of the description:
pages NONE , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____.

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination(under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages NONE

☐ the claims, Nos. NONE

☐ the drawings, sheets/~~fig~~ NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*
*** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US03/19884

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims 1-9, 11-20, 22-30, 32-42	YES
	Claims 10, 21, 31, 43	NO
Inventive Step (IS)	Claims NONE	YES
	Claims 1-43	NO
Industrial Applicability (IA)	Claims 1-43	YES
	Claims NONE	NO

2. CITATIONS AND EXPLANATIONS
Please See Continuation Sheet

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

V. 2. Citations and Explanations:

1. Claims 10, 19, 21, 31, and 43 lack novelty under PCT Article 33(2) as being anticipated by Okabe et al (US 6,355,109 B2). Okabe teaches a vacuum processing apparatus (Figure 1) comprising: a process chamber (21; Figure 1; column 4, lines 5-15) having a plurality of pumping ports (31; Figure 1); and a plurality of pumping cells (30; Figure 1) each connected to a respective pumping port (31; Figure 1) of said plurality of pumping ports (31; Figure 1), as claimed by claim 10.

Okabe further teaches:

i. The vacuum processing apparatus (Figure 1) according to Claim 10, further comprising equivalent means (23, 25; Figure 1) for reducing open volume within said process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 19

ii. The vacuum processing apparatus (Figure 1) according to Claim 10, wherein said process chamber (21; Figure 1; column 4, lines 5-15) facilitates the formation of plasma (column 4; lines 5-14), as claimed by claim 21

iii. A method of making an improved process chamber (21; Figure 1; column 4, lines 5-15), said method comprising the steps of providing lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of the process chamber (21; Figure 1; column 4, lines 5-15) adjacent to a process chamber (21; Figure 1; column 4, lines 5-15) volume, as claimed by claim 31

iv. The method according to Claim 31, further comprising the steps of providing an upper electrode (26; Figure 1; column 4; lines 5-14) to facilitate the formation of plasma (column 4; lines 5-14) in the process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 43

2. Claims 1-8, 22-29, 32-34, and 37-41 lack an inventive step under PCT Article 33(3) as being obvious over Okabe et al (US 6,355,109 B2). Okabe teaches a process chamber (21; Figure 1; column 4, lines 5-15) comprising a lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) and a side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) - claim 1.

Okabe further teaches:

i. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 1, wherein said process chamber (21; Figure 1; column 4, lines 5-15) is made of a single unit of plate stock (see constant cross-hatching for 21) - claim 2

ii. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 1, wherein said process chamber (21; Figure 1; column 4, lines 5-15) has at least one pumping port (31; Figure 1) configured to receive a pumping cell (30; Figure 1), as claimed by claim 4

iii. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 1, wherein said process chamber (21; Figure 1; column 4, lines 5-15) has a plurality of pumping ports (31; Figure 1) each configured to receive a pumping cell (30; Figure 1), as claimed by claim 5

iv. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 5, wherein said plurality of pumping ports (31; Figure 1) are located on said lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of said process chamber (21; Figure 1; column 4, lines 5-15) adjacent to a process chamber (21; Figure 1; column 4, lines 5-15) volume, as claimed by claim 6

v. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 1, further comprising equivalent means (23, 25; Figure 1) for reducing open volume within said process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 8

vi. A method of making an improved process chamber (21; Figure 1; column 4, lines 5-15), said method comprising the step of

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making the process chamber (21; Figure 1; column 4, lines 5-15) with a lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) and a side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) - claim 22

vi. The method according to Claim 22, wherein the process chamber (21; Figure 1; column 4, lines 5-15) is made of a single unit of plate stock (see constant cross-hatching for 21) having a thickness of about four inches, as claimed by claim 23

vii. The method according to Claim 22, further comprising the step of providing in the process chamber (21; Figure 1; column 4, lines 5-15) at least one pumping port (31; Figure 1) configured to receive a pumping cell (30; Figure 1), as claimed by claim 25

viii. The method according to Claim 22, further comprising the step of providing in the process chamber (21; Figure 1; column 4, lines 5-15) a plurality of pumping ports (31; Figure 1) each configured to receive a pumping cell (30; Figure 1), as claimed by claim 26

ix. The method according to Claim 26, further comprising the step of providing the plurality of pumping ports (31; Figure 1) on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of the process chamber (21; Figure 1; column 4, lines 5-15) adjacent to a process chamber (21; Figure 1; column 4, lines 5-15) volume, as claimed by claim 27

x. The method according to Claim 26, further comprising the steps of: providing a chuck assembly (22-25; Figure 1) in the process chamber (21; Figure 1; column 4, lines 5-15) - claim 28

xi. The method according to Claim 26, further comprising the steps of: providing an upper electrode (26; Figure 1; column 4; lines 5-14) to facilitate the formation of plasma (column 4; lines 5-14) in the process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 29

xii. The method according to claim 31, further comprising the step of making the process chamber (21; Figure 1; column 4, lines 5-15) with a lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) and a side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) - claim 32, the side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) having a height of at most about four inches.

xiii. The method according to claim 32, further comprising the step of providing the plurality of pumping ports (31; Figure 1) on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of the process chamber (21; Figure 1; column 4, lines 5-15) adjacent to a process chamber (21; Figure 1; column 4, lines 5-15) volume, as claimed by claim 37

xiv. The method according to Claim 32, further comprising the steps of providing a chuck assembly (22-25; Figure 1) in the process chamber (21; Figure 1; column 4, lines 5-15); and providing two pumping ports (31; Figure 1) on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of the process chamber (21; Figure 1; column 4, lines 5-15) symmetrically spaced about the chuck assembly (22-25; Figure 1) on opposing sides thereof, as claimed by claim 40

xv. The method according to Claim 40, further comprising the step of connecting two pumping cells (30; Figure 1) to the process chamber (21; Figure 1; column 4, lines 5-15), wherein each one of the two pumping cells (30; Figure 1) are connected to a respective one of the two pumping ports (31; Figure 1), as claimed by claim 41

Okabe does not teach the dimensions of his process chamber such that said side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) has a height of at most about four inches, as claimed by claim 1 and 32.

Okabe further does not teach:

vii. Okabe's single unit of plate stock (see constant cross-hatching for 21) having a thickness of about four inches, as claimed by claim 2

viii. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 2, wherein said plate stock (see constant cross-hatching for 21) is aluminum, as claimed by claim 3

ix. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 5, wherein three pumping ports (31; Figure 1) are provided on said lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of said process chamber (21; Figure 1; column 4, lines 5-15) symmetrically spaced about a chuck assembly (22-25; Figure 1) provided within said process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 7

x. the side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) having a height of at most about four inches - claim 22

xi. The method according to Claim 23, wherein the plate stock (see constant cross-hatching for 21) is aluminum, as claimed by claim 24

xii. providing three pumping ports (31; Figure 1) on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of the process chamber (21; Figure 1; column 4, lines 5-15) symmetrically spaced about the chuck assembly (22-25; Figure 1), as claimed by claim 28

xiii. The method according to claim 32, further comprising the step of making the process chamber (21; Figure 1; column 4, lines 5-15) of plate stock (see constant cross-hatching for 21) having a thickness of about four inches, as claimed by claim 33

xiv. The method according to claim 33, wherein the plate stock (see constant cross-hatching for 21) is aluminum, as claimed by claim 34

xv. The method according to Claim 32, further comprising the steps of: providing a chuck assembly (22-25; Figure 1) in the process chamber (21; Figure 1; column 4, lines 5-15); and providing three pumping ports (31; Figure 1) on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of the process chamber (21; Figure 1; column 4, lines 5-15) symmetrically spaced about the chuck assembly (22-25; Figure 1), as claimed by claim 38

xvi. The method according to Claim 38, further comprising the step of connecting three pumping cells (30; Figure 1) to the process chamber (21; Figure 1; column 4, lines 5-15), wherein each one of the three pumping cells (30; Figure 1) are connected to a respective one of the three pumping ports (31; Figure 1), as claimed by claim 39

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the dimensions of

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Okabe's process chamber including using aluminum material for Okabe's plate stock and adding additional pumping ports.
Motivation to optimize the dimensions of Okabe's process chamber including using aluminum material for Okabe's plate stock and adding additional pumping ports is for reducing the amount of processing gas required for a constant pressure, selecting an alternate and equivalent material for fabricating Okabe's process chamber, and for controlling the exhaust flow from Okabe's process chamber as taught by Okabe (column 6,lines 7-42) respectively. Further, it is well established that reproduction and dimensional optimization of apparatus components is obvious.

3. Claims 9, 11-18, 20, 30, 35, 36, and 42 lack an inventive step under PCT Article 33(3) as being obvious over Okabe et al (US 6,355,109 B2) in view of Thomas, Jr., Royal David et al (US 3,885,922 A). Okabe is discussed above. Okabe does not teach:

i. The process chamber (21; Figure 1; column 4, lines 5-15) according to Claim 8, wherein said means for reducing open volume is a chamber (21; Figure 1; column 4, lines 5-15) liner configured to displace open volume within said process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 9

ii. The vacuum processing apparatus (Figure 1) according to Claim 9, wherein said process chamber (21; Figure 1; column 4, lines 5-15) comprises a lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) and a side wall (vertical portions of 21; Figure 1; column 4, lines 5-15), the side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) having a height of at most about four inches, as claimed by claim 11

iii. The vacuum processing apparatus (Figure 1) according to Claim 11, wherein said process chamber (21; Figure 1; column 4, lines 5-15) is made of a single unit of plate stock (see constant cross-hatching for 21) having a thickness of about four inches, as claimed by claim 12

iv. The vacuum processing apparatus (Figure 1) according to Claim 12, wherein said plate stock (see constant cross-hatching for 21) is aluminum, as claimed by claim 13

v. The vacuum processing apparatus (Figure 1) according to Claim 11, wherein said plurality of pumping ports (31; Figure 1) are located on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of said process chamber (21; Figure 1; column 4, lines 5-15) adjacent to a process chamber (21; Figure 1; column 4, lines 5-15) volume, as claimed by claim 14

vi. The vacuum processing apparatus (Figure 1) according to Claim 11, wherein three pumping ports (31; Figure 1) are provided on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of said process chamber (21; Figure 1; column 4, lines 5-15) symmetrically spaced about a chuck assembly (22-25; Figure 1) provided within said process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 15

vii. The vacuum processing apparatus (Figure 1) according to Claim 15, wherein three pumping cells (30; Figure 1) are connected to said process chamber (21; Figure 1; column 4, lines 5-15), each one of said three pumping cells (30; Figure 1) being connected to a respective one of said three pumping ports (31; Figure 1), as claimed by claim 16

viii. The vacuum processing apparatus (Figure 1) according to Claim 11, wherein two pumping ports (31; Figure 1) are provided on the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) of said process chamber (21; Figure 1; column 4, lines 5-15) symmetrically spaced about a chuck assembly (22-25; Figure 1) on opposing sides thereof, as claimed by claim 17

ix. The vacuum processing apparatus (Figure 1) according to Claim 17, wherein two pumping cells (30; Figure 1) are connected to said process chamber (21; Figure 1; column 4, lines 5-15), each one of said two pumping cells (30; Figure 1) being connected to a respective one of said two pumping ports (31; Figure 1), as claimed by claim 18

x. The vacuum processing apparatus (Figure 1) according to Claim 19, wherein said means for reducing open volume comprises a chamber (21; Figure 1; column 4, lines 5-15) liner configured to displace open volume within said process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 20

xi. The method accordiay to Claim 22, further comprising the step of providing in the process chamber (21; Figure 1; column 4, lines 5-15) a chamber (21; Figure 1; column 4, lines 5-15) liner configured to displace open volume within the process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 30

xii. The method according to claim 32, further comprising the step of making the process chamber (21; Figure 1; column 4, lines 5-15) comprising a molding process, as claimed by claim 35

xiii. The method according to claim 32, wherein said lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) is a plate and said side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) is a rolled cylinder, further comprising the step of making the process chamber (21; Figure 1; column 4, lines 5-15) comprising welding (column 2, lines 29-47) the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) to the side wall (vertical portions of 21; Figure 1; column 4, lines 5-15), as claimed by claim 36

xiv. The method according to Claim 31, further comprising the step of providing in the process chamber (21; Figure 1; column 4, lines 5-15) a chamber (21; Figure 1; column 4, lines 5-15) liner configured to displace open volume within the process chamber (21; Figure 1; column 4, lines 5-15), as claimed by claim 42

Thomas teaches:

i. The process chamber (Figure 3; column 4, lines 44-48) according to Claim 8, wherein said means for reducing open volume is a chamber (Figure 3; column 4, lines 44-48) liner (21; Figure 3; column 4, lines 44-48) configured to displace open volume within said process chamber (Figure 3; column 4, lines 44-48), as claimed by claim 9

ii. The vacuum processing apparatus (Figure 3) according to Claim 11, wherein said process chamber (Figure 3; column 4, lines 44-48) is made of a single unit of plate stock (see constant cross-hatching for 21) having a thickness of about four inches, as claimed by claim 12

iii. The vacuum processing apparatus (Figure 3) according to Claim 12, wherein said plate stock is aluminum (column 11; lines 65-67),

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as claimed by claim 13

x. The vacuum processing apparatus (Figure 3) according to Claim 19, wherein said means for reducing open volume comprises a chamber (Figure 3; column 4, lines 44-48) liner (21; Figure 3; column 4, lines 44-48) configured to displace open volume within said process chamber (Figure 3; column 4, lines 44-48), as claimed by claim 20

xi. The method accordiay to Claim 22, further comprising the step of providing in the process chamber (Figure 3; column 4, lines 44-48) a chamber (Figure 3; column 4, lines 44-48) liner (21; Figure 3; column 4, lines 44-48) configured to displace open volume within the process chamber (Figure 3; column 4, lines 44-48), as claimed by claim 30

xii. The method according to claim 32, further comprising the step of making the process chamber (Figure 3; column 4, lines 44-48) comprising a molding (Figure 13; column 5, line 67 - column 6, line 7) process, as claimed by claim 35

xiii. The method according to claim 32, wherein said lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) is a plate and said side wall (vertical portions of 21; Figure 1; column 4, lines 5-15) is a rolled (column 2, lines 29-47) cylinder, further comprising the step of making the process chamber (Figure 3; column 4, lines 44-48) comprising welding (column 2, lines 29-47) the lower wall (portion of 21 at 31; Figure 1; column 4, lines 5-15) to the side wall (vertical portions of 21; Figure 1; column 4, lines 5-15), as claimed by claim 36

xiv. The method according to Claim 31, further comprising the step of providing in the process chamber (Figure 3; column 4, lines 44-48) a chamber (Figure 3; column 4, lines 44-48) liner (21; Figure 3; column 4, lines 44-48) configured to displace open volume within the process chamber (Figure 3; column 4, lines 44-48), as claimed by claim 42

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the dimensions of Okabe's process chamber, using aluminum material for Okabe's plate stock, adding additional pumping ports, and fabricating Okabe's process chamber according to the teachings of Thomas.

Motivation to optimize the dimensions of Okabe's process chamber, using aluminum material for Okabe's plate stock, adding additional pumping ports, and fabricating Okabe's process chamber according to the teachings of Thomas is for reducing the amount of processing gas required for a constant pressure, selecting an alternate and equivalent material for fabricating Okabe's process chamber, and for controlling the exhaust flow from Okabe's process chamber as taught by Okabe (column 6,lines 7-42) respectively. Further, it is well established that reproduction and dimensional optimization of apparatus components is obvious. Further, Thomas teaches that his process chamber manufacturing method produces "heavy-walled pressure vessels with corrosion resistant linings firmly bonded to the structural backing material. " (column 3, lines 62-65).

---------- NEW CITATIONS ----------

F US 3,885,922 A (THOMAS et al.) 27 May 1975, see column 3, lines 59-65